



Army Model Improvement Program & Simulation Technology Proposal for

AMSEC

6 November 2000

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AGENDA

- **Background**
 - **Vision and Requirements**
 - **Discussion from last AMSEC**
 - **The Good news - We are making progress**
 - **There is a lot going on**
- **Comments from the Field**
 - **Key Stakeholders**
- **Assessment**
- **Summary**
- **Recommendations**
- **Conclusions**



The Army Vision:

Challenge: Solution Space is Complex
Solution impacts soldiers
Decisions are expensive

Evolving Force Requirements

Asymmetrical Environment with Asymmetrical Threats
Full Spectrum Challenge

- Joint & Combined Ops
- SASO/Peacekeeping
- High Intensity Conflict
- Major Theater War

Responsive
Deployable
Agile
Versatile
Lethal *

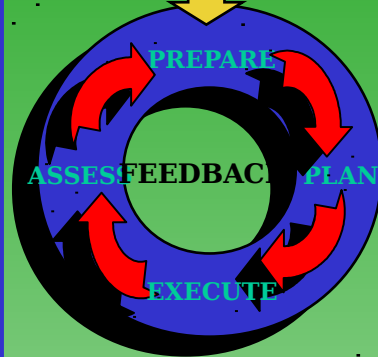
Survivable



FULL SPECTRUM

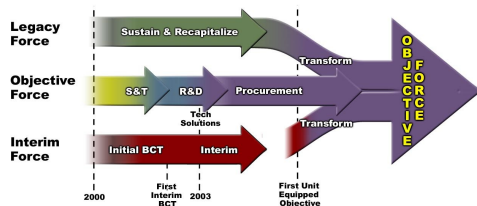
WARTIME MISSION

METI



FM 25-100/10

The Army Transformation



... Responsive, Deployable, Agile, Versatile, Lethal, Survivable, Sustainable.

DOMINANCE

CSA Vision Speech
"Soldiers on point for the Nation
transforming this, the most respected Army in the world, into a strategically responsive force that is dominant across the full spectrum of

Objective Force

- Lethal Small Units/Teams
- Adaptive Leaders & Soldiers



THE DIRECTION WE ARE HEADING

Increasing Reliance on M&S: TEMO, ACR, RDA

YESTERDAY'S TRAINING

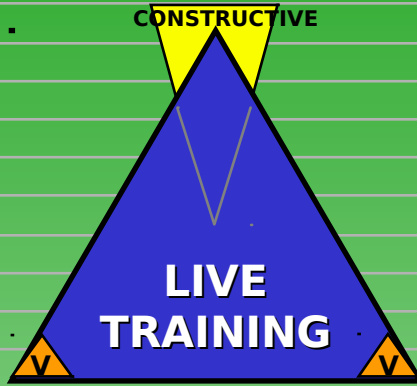
TODAY'S TRAINING

TOMORROW'S TRAINING

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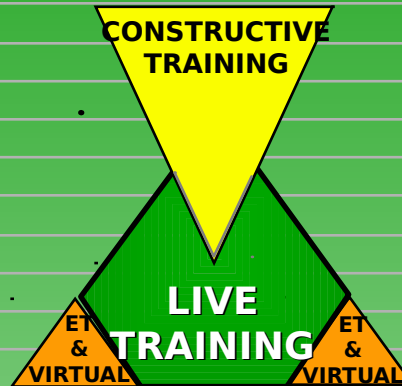
JOINT
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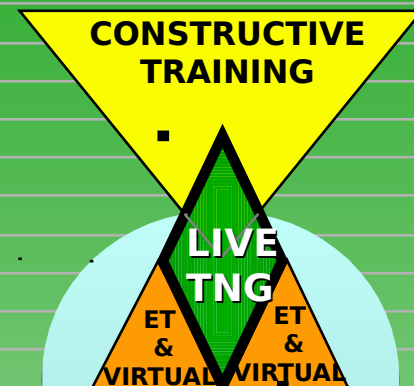
INSTITUTIONAL TRAINING

CONSTRUCTIVE
TRAINING



INSTITUTIONAL TRAINING

CONSTRUCTIVE
TRAINING



DISTANCE LEARNING

SCHOOL HOUSE

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Types of Analysis (ACR and RDA)

Strategy, Strategic Environment, & Concept Studies
Force & Organization Design Studies
MNS & Materiel Operational Requirements
AoAs (Individual System Design or System of System)
FAA & BOS Analysis
Experimentation & Demonstrations
Lifecycle Cost & Resource Allocation
Training Strategies (Balance Between L-V-C, Embedded)

M&S Supports:

- More insightful analysis
- Better trained:
soldiers, units & staffs
- Better system and organizational designs

Increased Combat Effectiveness



Last AMSEC 11 May 2000

- “ Sir, I wish I could tell you that our M&S systems could *fully* answer the questions you are asking...
Questions such as: ***MOUT, IO, Logistics, Life Cycle Cost, SASO, FCS, Army Transition, QDR, FCS***, etc... Sir, they can't”
- “Sir, I wish I could tell you we have adequate R&D and S&T programs to correct these problem areas.... Sir, we don't”

Our operating environment is becoming more complicated...

- We are falling behind in functionality
- Can't fully support required analysis - complex issues
- We are not maximizing use of available technologies
- We are not adequately developing new technologies....
- Many ongoing efforts are not focused or meet critical needs



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More specifically,
our M&S Investment Plan
for Advanced Concepts
is not keeping pace
with future requirements.



Much Has Been Done....

We Have Much Work to Do...

Utility

Functionality

Cognitive Behaviors

COAD

Automated Decision Support

Automated Behaviors

Integrated C4ISR and Simulations

Life Cycle Cost

OOTW

Logistics

Info Ops

Effects Based Results

COAA

MOUT

C4ISR

Joint Ops

Terrorism

Common SNE

Asymmetric Threats

NBC

Interoperable C4ISR and Simulation

Common Models

Attrition

Maneuver

Indirect Fire

Direct Fire

Separate C4ISR and Simulations

ALSP

HLA

SEDRIS

Composable Objects

Rapid Common Data Scenario Generation

Data Re-use

Seamless L-V-C

Distributed Sims

Enablers & Cost Reducers

Time



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Rapid Common Data

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Data Re-use

Seamless L-V-C

Scenario Generation

Enablers & Cost Reducers

* Critically linked to Army Transformation
Ⓢ Address cost drivers
⚡ Leap-ahead capability

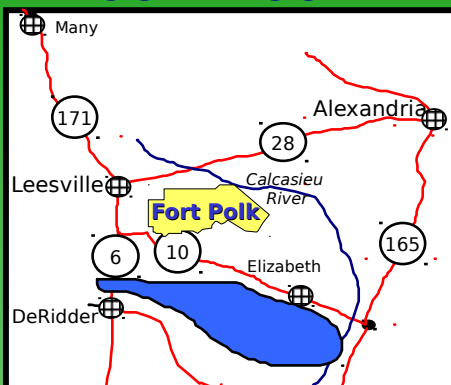
Time



JCF-AWE STE Digital Environment

LIVE BOX

100 x 100 km Bo

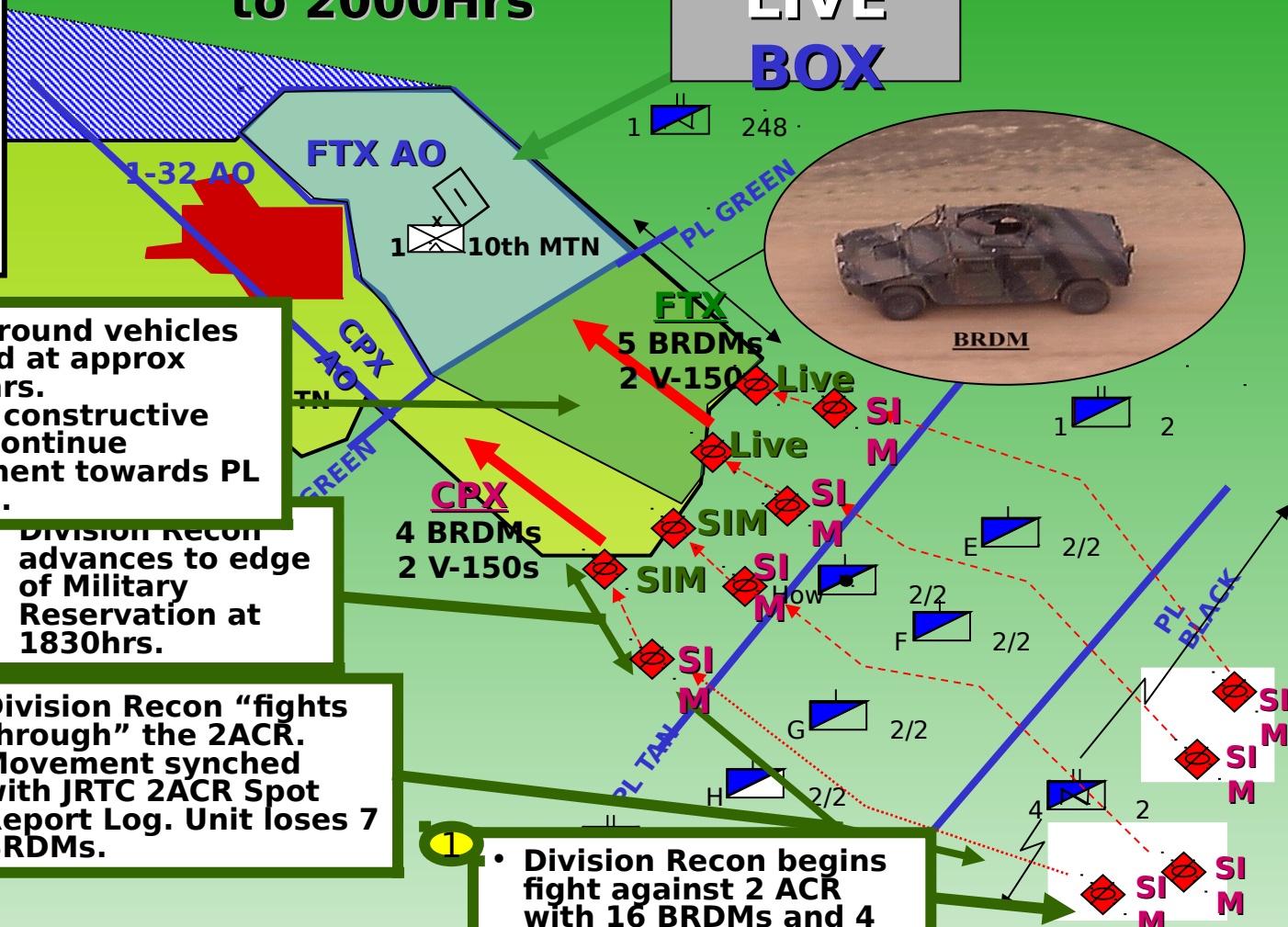


- **Wraparound vehicles deleted at approx 1900 hrs.**
- **Live & constructive units continue movement towards PL GREEN.**

DIVISION Recon advances to edge of Military Reservation at 1830hrs.

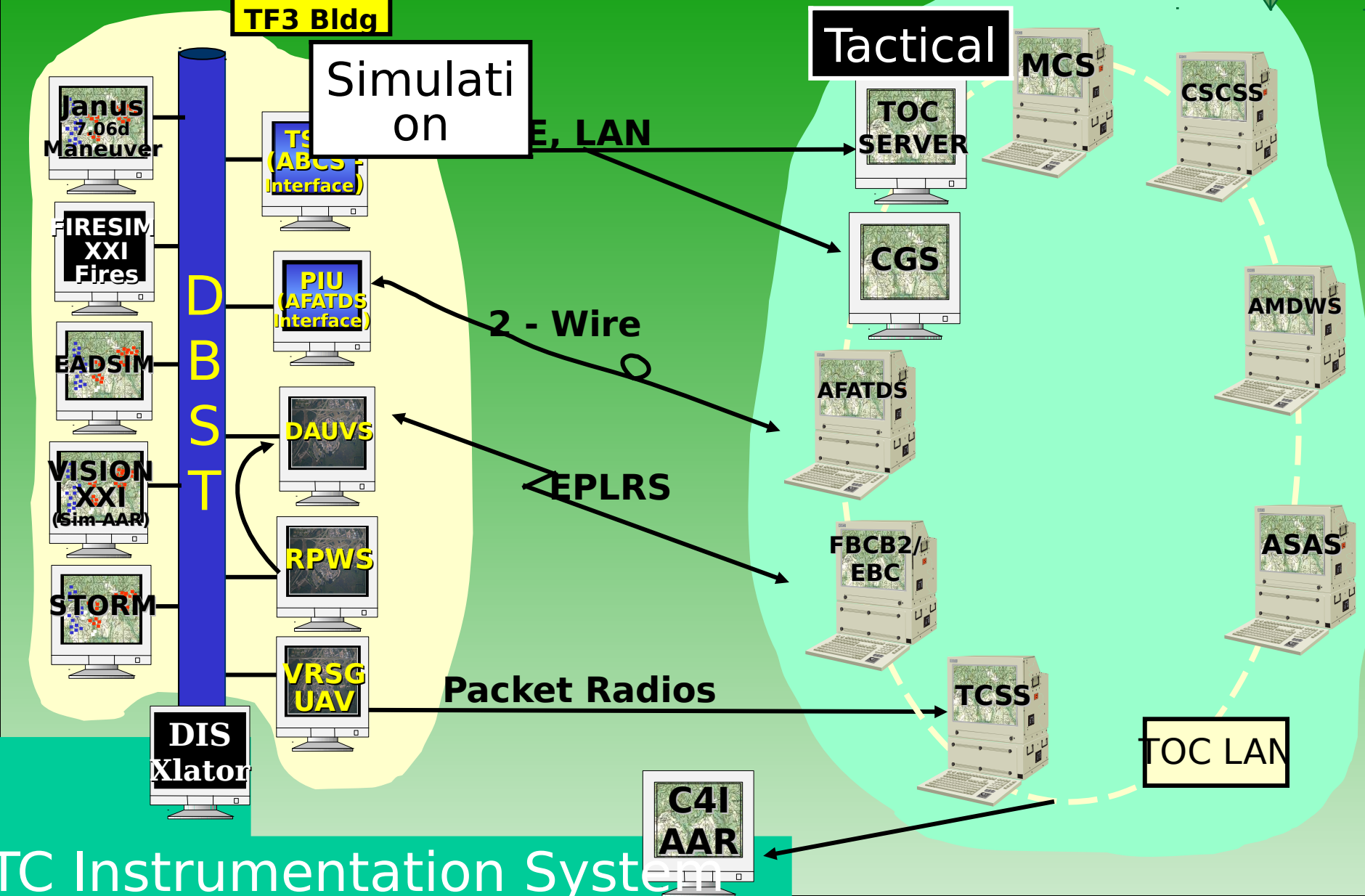
- **Division Recon “fights through” the 2ACR.**
- **Movement synched with JRTC 2ACR Spot Report Log. Unit loses 7 BRDMs.**

- **Division Recon begins fight against 2 ACR with 16 BRDMs and 4 V-150s**





JCF-AWE STE Digital Environment





High Payoff Areas to Funded Project Crosswalk

- ◆ Expeditionary and accurate generation of terrain data
 - ✓ Terrain Common Data Model
 - ✓ Co-Production/Update of CDM Data Sets
 - ✓ Automated Terrain Data Intensification
- Integration of real world C4I systems and simulations
 - ✓ Integrating C4I in COMBAT XXI
 - ✓ Simulation-C4I Module for Plans, Logistics, and Exercises
 - ✓ Army Standard Database Synchronization Model
- Standard methods and common requirements for data/scenario generation
 - ✓ Standard Data Exchange Methods
- Modeling to facilitate analysis of (joint) mobilization issues
 - ✓ Force Requirements Generator
- Integration of logistics within simulations
 - ✓ Force Requirements Generator
 - ✓ Logistics Federation
- Use of M&S to complement live testing
 - ✓ RDEC Federation
- Physics of failure
 - ✓ Mechanical PoF Demonstration and Life Cycle Methodology Development



AMIP /SIMTECH

High Payoff AMIP Projects

- ◆ Active Protection (CASTFOREM) - AMSAA
- Upgrades to ATCOM - PM Comanche
- Standard Mobility Model Suite (NRMM) - ERDC-WES



Major Investment Areas of NASA Intelligent Systems (IS) Program

Automated Reasoning

- Executive Reasoning★
- Case-Based Reasoning★
- High Assurance Software
- Biologically-Motivated (Biomimetic) Adaptive Systems★
- Planning & Scheduling

Human-Centered Computing

- Optimized Display★
- Immersive / Haptic Environments
- Biologically-Motivated (Biomimetic) Computer/Component Architectures and SW★
- Internet-Based Knowledge Representation★

Intelligent Systems for Data Understanding

- Geographically Distributed Computing★
- Knowledge Management and Institutional Knowledge Capture★
- Reconfigurable Computer Architectures★

Revolutionary Computing

- Quantum Mechanical Computing★
- Neurally-inspired Computing
- Holographic Memory Devices
- Biological Computing

★ Significant Match
to Needs of Army



Ongoing Efforts:

"There is a lot going on"

- AMIP / SIMTECH
- DMSO Warfighter Assessment (ID Warfighter Needs)
- Institute For Creative Technologies (ICT)
- Army S&T Master Plan
- FCS
- DARPA (CP XXI and Asymmetric Threat STOs)
- STRICOM R&D Program (SNE STO)
- University XXI
- CECOM
- Industry, Others....
- NASA
- Battle Labs & RDECs
- DMSO Integration Task Force
- DMSO
 - Human Behavior Representation Program
 - S&T Initiatives
 - Integrated Natural Environment
- Multi-Discipline University Research Initiatives (MURIs)
- Army EDB IPT, Simulation-C4I Interoperability IPT
- SMART



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Input from Stakeholders:

Deficient M&S Areas: TEMO, ACR, RDA

- **MOUT:** PM FCS, TRAC, TRAC-W, TRADOC-CD, DCSOPS-TA, AMSAA, EUCOM
- **C4ISR (COAA):** PM FCS, CAA, TRAC, DCSOPS-TA, EUCOM, PACOM, NRC, USFK
- **Logistics:** PM FCS, TRAC-W, TRADOC-CD, DCSOPS-TA, AMSAA, CENTCOM, CASCOM, NRC
- **SSC (SASO, OOTW):** PM-FCS, CAA, TRAC-W, TRADOC-CD, DCSOPS-TA, EUCOM, CENTCOM, PACOM, SOUTHCOM, DMSO
- **Composable Behaviors:** PM-FCS, TRAC, DCSOPS-TA, EUCOM, NRC
- **SNE:** PM FCS, CENTCOM, SOCOM, DMSO
- **Mobilization and Deployment:** PM FCS, DCSOPS-TA, CENTCOM, PACOM, TRANSCOM
- **ACR funding and Integrated Management:** PM FCS, TRAC, DCSOPS-TA
- **Reduced Cost:** EUCOM, CENTCOM, USFK
- **Concept Development for FCS:** TRADOC-DCG, DCSOPS-TA, NRC
- **Dismounted Infantry:** TRAC, AMSAA, EUCOM
- **Information Operations:** CAA, TRAC-W, DCSOPS-TA
- **Simulation - C4I Interoperability:** NSC, EUCOM, SPACECOM
- **Life Cycle Cost:** PM-FCS, AMSAA
- **M&S Architecture:** PM-FCS, DCSOPS-TA, NRC, NSC
- **Human Behaviors:** TRAC-W, EUCOM, DMSO

CINC Input:
DMSO Surveys with CINC Staffs



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Deficient M&S Areas: Current

Path

Cursory Assessment for FY 03-07

Timeframe

- **MOUT: MOUT ACTD** (Live Training), **Data, Physics, and Behaviors, Scale**

- **C4ISR (COAA):** OneSAF, WARSIM

- **Logistics:**

- **SSC (SASO, OOTW):** WARSIM, OneSAF

- **Composable Behaviors:** OneSAF

- **SNE:** DMSO INE, Army EDB IPT, NIMA GI3 IPT

- **Mobilization and Deployment:** MOBSIM, JWARS

- **ACR funding and Integrated Management:**

- **Reduced Cost:** WARSIM

- **Concept Development for FCS: System of System Capability**

- **Dismounted Infantry:**

- **Information Operations:**

- **Simulation - C4I Interoperability:** DBST, OneSAF, WARSIM, SIM-C4I IPT

- **Life Cycle Cost:**

- **M&S Architecture:**

- **Human Behaviors:**

- **WMD:**

- **Common Data:** SNE (JWARS, JSIMS, OneSAF, CCTT, Cbt XXI),

Serious Problems

Minor Problems

Adequate Functional



Tactical UAV

**Unmanned
Shooter
Platform**



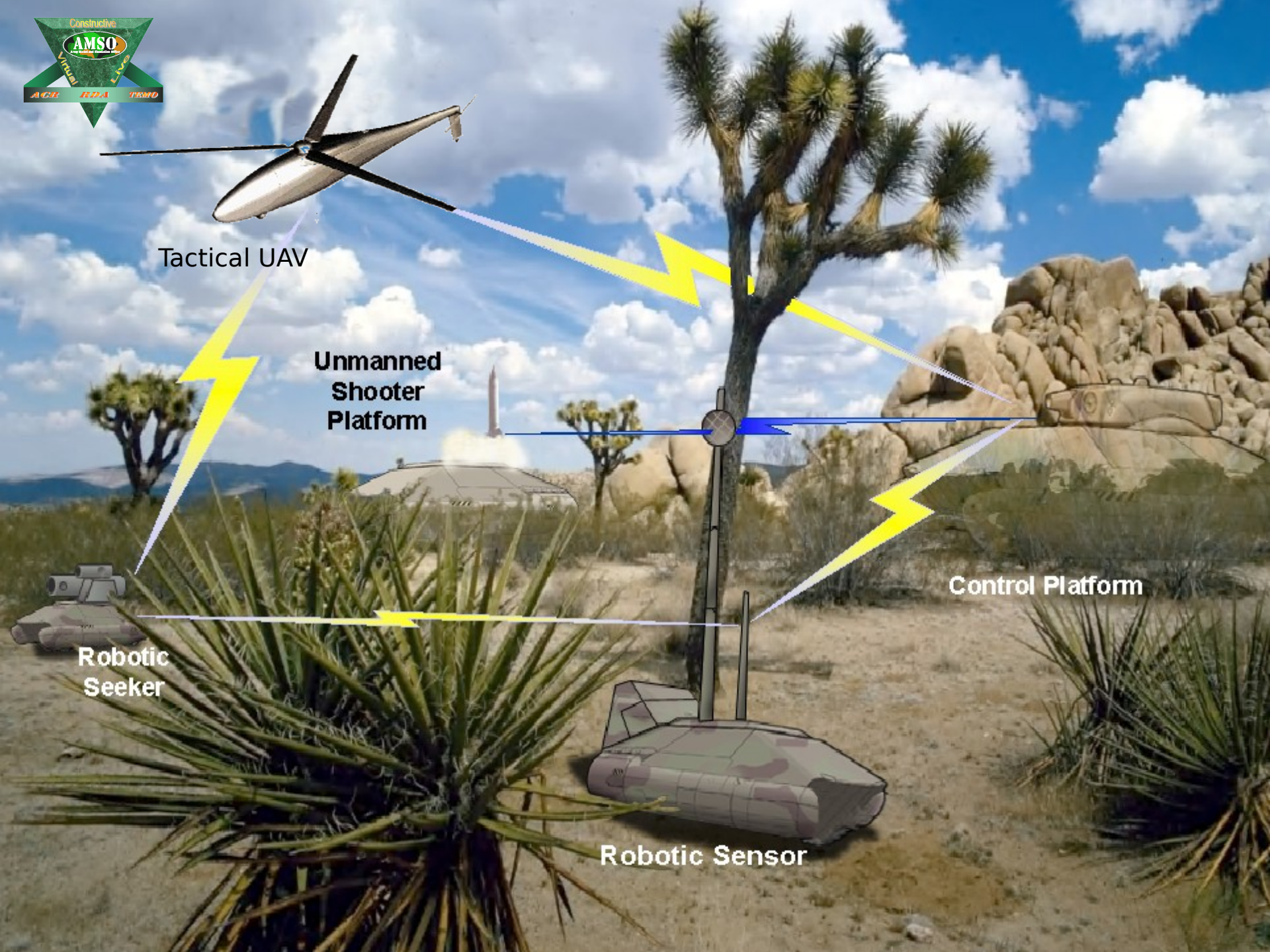
Control Platform



**Robotic
Seeker**



Robotic Sensor





Predicted Path based on current and projected capabilities:

- Simulate piece-parts only
- Little to no System-of-Systems synergy represented or analyzed
- Impacts of new logistics system and effectiveness not included
- No plan to develop C4ISR and M&S systems concurrently

Tactical UAV

Unmanned
Shooter
Platform

Robotic
Seeker

Control Platform

Robotic Sensor





M&S Architecture for ACR

Why Not?

Today's System:
Data is Interpreted,
Translated, and
Shared

**Little to no Inherent
Interoperability**

**Integrated / Interoperable
Systems are Key to Support:**

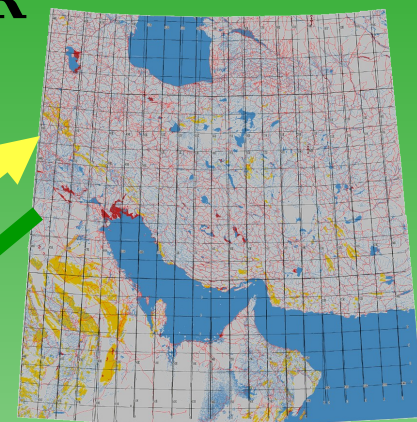
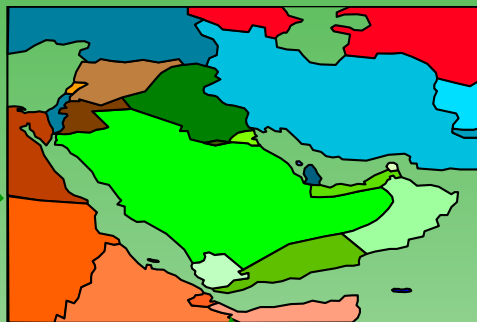
- Logistic Analysis
- Quantify Effects of C4ISR

Operational/Strategic

**CEM to
JWARS**

**Operational-
EAGLE & VIC to
AWARS**

**Tactical-
CASTFOREM to CBT XXI
JANUS to OneSAF**



Common Data: Models, Terrain, Algorithms, etc



Summary

- ↓ Ability to develop and assess advanced concepts is not keeping up with changing requirements (MOUT, Logistics, IO, LCC, etc..)
- ↓ Analytical tools being used to support FCS, Army Transformation, QDR, Joint Experimentation, Objective Force O&O (Specifically Logistics) are not adequate - Analyst and Subject Matter Experts filling the void
- ✓ Next generation of training simulations will address important issues (SIM-C\$I Interoperability, Joint Operations*, Overhead Cost)
- ↓ Next generation ACR models (AWARS, CBT XXI) not properly resourced
 - Resources to meet need are being taken out of hide
 - Current efforts - update current capabilities (OOP, HLA) vice new functionality
- **Money, in and of itself, is not the problem**
 - Many diverse efforts not prioritized or synchronized
 - AMIP/SIMTECH moving in right direction - requires more top-down focus
 - Major S&T funding (Army STO program) focused on approved systems - not analytical tools required to assess new concepts and Analysis of Alternatives which drive new systems requirements
 - C4I and M&S systems on parallel axis - not integrated
 - Areas such as MOUT, Logistics, IO, Automated Behaviors need long term plans supported with consistent and predictable 6.1, 6.2 or 6.3 efforts



Recommendations

- ❑ Establish cross-domain multi-discipline Study Team to provide AMSEC with coordinated M&S investment strategy**
 - **Co-Chairs: AMSO and DASA(R&T)**
- ❑ Explore Integrated Development of C4I and M&S systems**
- ❑ Establish \$6.4M AMIP/SIMTECH funding level during Mini-POM 03-07**

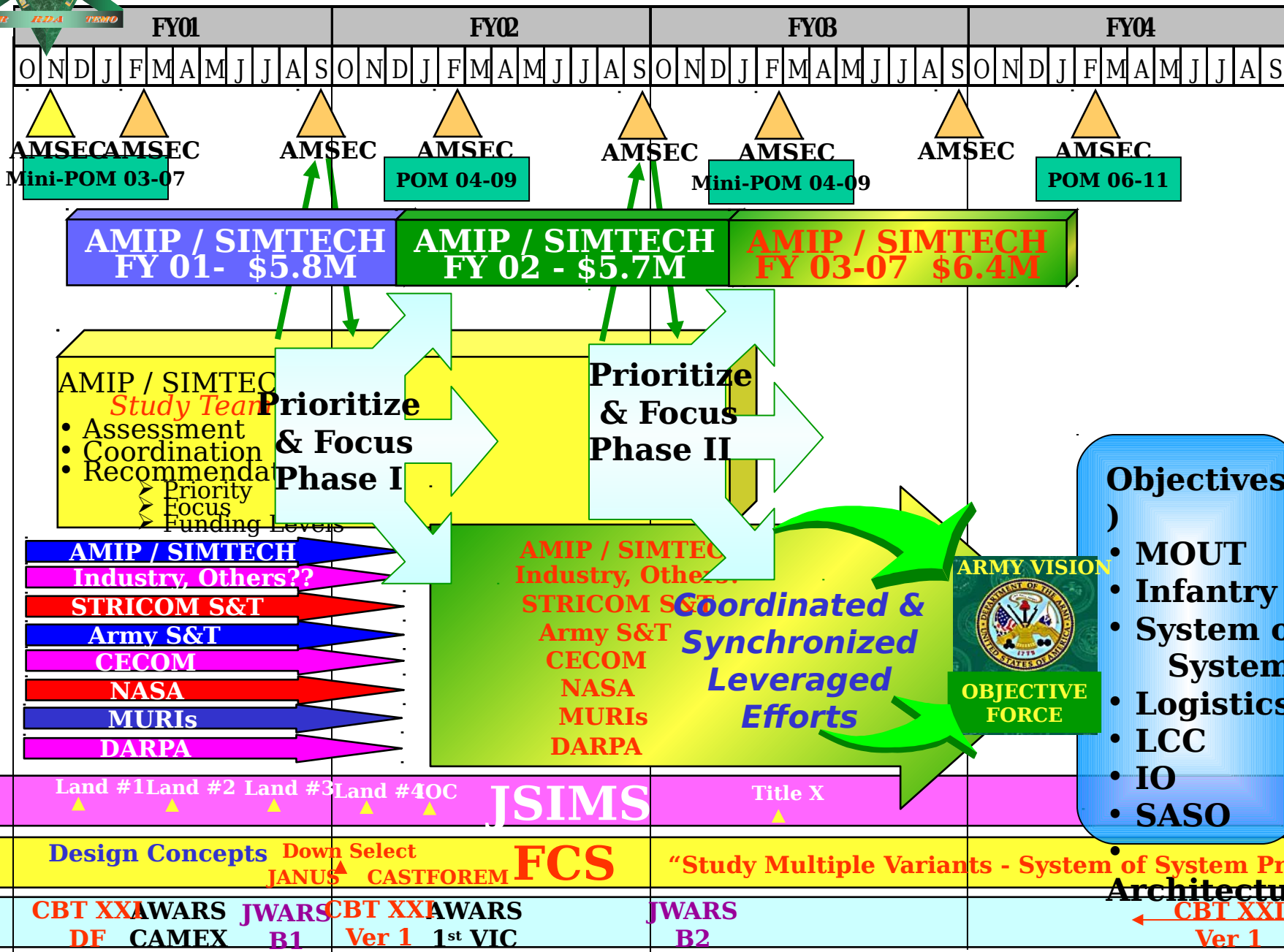
Strawman:

- **TR \$4M (Increase \$.2M per Year 03-07)**
- **EE \$ 2.4M (Increase \$.4M per Year 03-07)**
- **Bill-payers identified as part of Mini-POM**

Assumes following is funded by SMART Execution Plan:

- **Task # 3.2.1 - \$2M / year for ACR model improvements**
- **Task 3.3.3 - \$1.6 M / year to fund SMART related**

AMIP/SIMTECH projects





Conclusion: “We must modify our S&T investment strategy..

M&S Derived Advanced Concepts and Analysis of Alternatives are prerequisite to obtaining cost-effective solutions”

Near-term: Relatively small, top-down-focused investment in:

- M&S Functionality: MOUT, LOGISTICS, IO, C4ISR, ETC....
- M&S and C4I Architectures
- Enablers:
- Cost Reducers: Common data and terrain

- Greater insights into new concepts
- More effective systems-of-systems
- More efficient logistics system – better understanding of risks
- Reduced life cycle cost (SMART)
- Plug and play
- C4I/MS Interoperability by design

***All critical for success of Army Transformation and FCS**

- May be too late for full use
- “You can’t reap what you didn’t sow”



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